(19) World Intellectual Property Organization International Bureau



(43) International Publication Date 20 January 2005 (20.01.2005)

PCT

(10) International Publication Number WO 2005/005773 A3

(51) International Patent Classification7:

E21B 43/16

(21) International Application Number:

PCT/IN2004/000206

(22) International Filing Date:

14 July 2004 (14.07.2004)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

892/DEL/2003

14 July 2003 (14.07.2003) IN

- (71) Applicants (for all designated States except US): THE ENERGY RESEARCH INSTITUTE [IN/IN]; Darbari Seth Block, Habitat Centre, Lodhi Road, New Delhi 110003 (IN). INSTITUE OF RESERVOIR STUDIES [IN/IN]; Oil and Natural Gas Corporation Ltd, Jeevan Bharati, Connaught Place, New Delhi 110001 (IN).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): LAL, Banwari [IN/IN]; The Energy Research Institute, Darbari Seth Block, Habitat Centre, Lodhi Road, New Delhi 110003 (IN). REDDY, Mula, Ramajaneya, Varaprasada [IN/IN]; The Energy Research Institute, Darbari Seth Block, Habitat Centre, Lodhi Road, New Delhi 110003 (IN). AGNIHOTRI, Anil [IN/IN]; Institue of Reservoir Studies, Oil & Natural Gas Corporation Ltd, Chandekheda Campus, Ahmedabad 380005 (IN). KUMAR, Ashok [IN/IN]; Institue of Reservoir Studies, Oil & Natural Gas Corporation Ltd, Chandekheda Campus, Ahmedabad 380005 (IN). SARBHAI, Munish, Prasad [IN/IN]; Institue of Reservoir Studies, Oil & Natural Gas Corporation Ltd, Chandekheda Campus, Ahmedabad 380005 (IN). SINGH, Nimmi [IN/IN]; Institue of Reservoir Studies, Oil & Natural Gas Corporation Ltd, Chandekheda Campus, Ahmedabad 380005 (IN). KHURANA, Raj, Karan [IN/IN]; Institue of Reservoir Studies, Oil & Natural Gas Corporation Ltd, Chandekheda Campus, Ahmedabad 380005 (IN). KHAZANCHI, Shinben, Kishen [IN/IN]; Institue of Reservoir Studies, Oil & Natural Gas Corporation Ltd, Chandekheda Campus, Ahmedabad 380005

(IN). MISRA, Tilak, Ram [IN/IN]; Institue Of Reservoir Studies, Oil & Natural Gas Corporation Ltd, Chandekheda Campus, Ahmedabad 380005 (IN).

- (74) Agents: LAKSHMIKUMARAN, Varadharcharl et al.; Lakshmikumaran & Sridharan, B-4/158, Safdarjung Enclave, New Delhi 110029 (IN).
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declaration under Rule 4.17:

 as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for all designations

Published:

- with international search report
- with (an) indication(s) in relation to deposited biological material furnished under Rule 13bis separately from the description
- (88) Date of publication of the international search report: 24 March 2005

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: A PROCESS FOR ENHANCED RECOVERY OF CRUDE OIL FROM OIL WELLS USING NOVEL MICROBIAL CONSORTIUM

(57) Abstract: The present invention provides a microbial consortium containing three hyperthermophilic, barophilic, acidogenic, anaerobic bacterial strains for enhanced oil recovery from oil reservoirs where temperatures range from 70 °C to 90 °C. The said microbial consortium is unique in producing a variety of metabolic products mainly CO₂, methane, biosurfactant, volatile fatty acids and alcohols in the presence of specially designed nutrient medium. These metabolic products increase sweep efficiency of crude oil from oil bearing poles of rock formation. The present invention also provides a process for enhancing the oil recovery by in situ application of the said microbial consortium



(19) World Intellectual Property Organization International Bureau



- I NOOD BUUSTUU II SEAD IIRK BOIN BOIN BOIN OO I II II BANII BOIN BUU BUU BOOD IIN BAADA ISKA IID MAA

(43) International Publication Date 20 January 2005 (20.01.2005)

PCT

(10) International Publication Number WO 2005/005773 A2

(51) International Patent Classification7:

E21B 43/16

(21) International Application Number:

PCT/IN2004/000206

(22) International Filing Date:

14 July 2004 (14.07.2004)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data: 892/DEL/2003

14 July 2003 (14.07.2003) IN

- (71) Applicants (for all designated States except US): THE ENERGY RESEARCH INSTITUTE [IN/IN]; Darbari Seth Block, Habitat Centre, Lodhi Road, New Delhi 110003 (IN). INSTITUE OF RESERVOIR STUDIES [IN/IN]; Oil and Natural Gas Corporation Ltd, Jeevan Bharati, Connaught Place, New Delhi 110001 (IN).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): LAL, Banwari [IN/IN]; The Energy Research Institute, Darbari Seth Block, Habitat Centre, Lodhi Road, New Delhi 110003 (IN). REDDY, Mula, Ramajaneya, Varaprasada [IN/IN]; The Energy Research Institute, Darbari Seth Block, Habitat Centre, Lodhi Road, New Delhi 110003 (IN). AGNIHOTRI, Anil [IN/IN]; Institue of Reservoir Studies, Oil & Natural Gas Corporation Ltd, Chandekheda Campus, Ahmedabad 380005 (IN). KUMAR, Ashok [IN/IN]; Institue of Reservoir Studies, Oil & Natural Gas Corporation Ltd, Chandekheda Campus, Ahmedabad 380005 (IN). SARBHAI, Munish, Prasad [IN/IN]; Institue of Reservoir Studies, Oil & Natural Gas Corporation Ltd, Chandekheda Campus, Ahmedabad 380005 (IN). SINGH, Nimmi [IN/IN]; Institue of Reservoir Studies, Oil & Natural Gas Corporation Ltd, Chandekheda Campus, Ahmedabad 380005 (IN). KHURANA, Raj, Karan [IN/IN]; Institue of Reservoir Studies, Oil & Natural Gas Corporation Ltd, Chandekheda Campus, Ahmedabad 380005 (IN). KHAZANCHI, Shinben, Kishen [IN/IN];

Institue of Reservoir Studies, Oil & Natural Gas Corporation Ltd, Chandekheda Campus, Ahmedabad 380005 (IN). MISRA, Tllak, Ram [IN/IN]; Institue Of Reservoir Studies, Oil & Natural Gas Corporation Ltd, Chandekheda Campus, Ahmedabad 380005 (IN).

- (74) Agents: LAKSHMIKUMARAN, Varadharcharl et al.; Lakshmikumaran & Sridharan, B-4/158, Safdarjung Enclave, New Delhi 110029 (IN).
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declaration under Rule 4.17:

 as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for all designations

Published:

- without international search report and to be republished upon receipt of that report
- with (an) indication(s) in relation to deposited biological material furnished under Rule 13bis separately from the description

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: A PROCESS FOR ENHANCED RECOVERY OF CRUDE OIL FROM OIL WELLS USING NOVEL MICROBIAL CONSORTIUM

(57) Abstract: The present invention provides a microbial consortium containing three hyperthermophilic, barophilic, acidogenic, anaerobic bacterial strains for enhanced oil recovery from oil reservoirs where temperatures range from 70 °C to 90 °C. The said microbial consortium is unique in producing a variety of metabolic products mainly CO₂, methane, biosurfactant, volatile fatty acids and alcohols in the presence of specially designed nutrient medium. These metabolic products increase sweep efficiency of crude oil from oil bearing poles of rock formation. The present invention also provides a process for enhancing the oil recovery by in situ application of the said microbial consortium

